

## Trouble Shooting Diesel Generator Sets

## Information Sheet # 28

### 1.0 Introduction:

Time is important when a generator system requires an on-site visit from a technician to attend to a system failure or an alarm warning, both to ensure that backup generators are ready to run if the primary power source goes off line and because the longer it takes to diagnose a fault, the more it costs to keep a technician on site.

*This Information Sheet discusses the best trouble shooting techniques for quickly diagnosing any fault condition and ensuring minimum downtime and elimination of a future occurrence: (Continued over)*



### Primary Causes of Failure and/or Poor Performance: (N. B. 80/20 Rule: 80% of issues to trouble show are 20% of most likely issues)

Item #	Issue to Trouble Shoot	Primary Cause	Remedy and On-Going Action
1	Generator Fails to Start	Battery Status	Faulty battery or charger - Test battery charger and replace if necessary
2	Generator Fails to Start	No Fuel	Check fuel level, if OK check fuel delivery and quality, consider fuel polishing
3	Shutdown due to Low Oil Pressure	Oil Level too Low	Check dipstick, and ensure oil top off part of planned maintenance program (PMP)
4	Shutdown due to High Temperature	Low Coolant Level	Coolant levels should be checked and coolant check part of PMP
5	Generator Set Poor Performance	Filtration Systems	Clogged fuel and air filters will retard performance, change and change hours in PMP
6	Generator Does Not Carry Full Load	Carbonization	Lightly run engines build up carbon, fully load and have load bank testing service

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Generator systems are complex combinations of many components working together. Sometimes an issue is hard to isolate when it interfaces with many other components within the system. Ensuring a timely repair requires both an extensive knowledge of the complete system and the experience to quickly identify and troubleshoot the root cause of any failure or alarm condition.

## 2.0 Trouble Shooting by a Qualified Technician:

Troubleshooting of a generator system should be undertaken only by a qualified generator technician. Major generator-set manufacturers service and support their generator systems through their authorized networks of distributors throughout North America. Generator manufacturers such as Kohler ensure their distributors have trained technicians to service and troubleshoot any issues with the generator system. Your Kohler distributor technician will have:

- **Hands on experience** - The technician has practical experience and is not just a classroom student. The more field service gained is likely to provide benefits in troubleshooting areas
- **Electrical Generating Systems Association (EGSA)** - This organization has more than 800 member companies worldwide. EGSA enables members to stay on top of the rapidly changing landscape of on-site power through networking and sharing best practices and also provides educational training covering two-tier-level technical aspects of power generation. Anyone new to the industry or who may require a refresher course can attend the Basic Power School to gain a strong foundation in all aspects of generator technology. This training is particularly beneficial for sales, marketing, parts, service and even administrative staff members. These schools are conducted throughout the U.S. on a regular schedule.  
  
EGSA also organizes and hosts an Advanced Power School program, where highly skilled and knowledgeable instructors give attendees a greater depth of technical education on all subjects related to generator technologies. Attendees are given a Technician Certification examination to ensure they have attained sufficient levels of skills, knowledge and expertise to be proficient in the topics covered. These technicians can confidently demonstrate that they now possess the vital knowledge and skills to install, service and maintain on-site power generators. See EGSA website details below.
- **Generator Distributor Technician** - The authorized distributor of your principal generator set has on staff service technicians that have been extensively trained in current service techniques. They are familiar with the latest test equipment and procedures as defined by organizations such as a UL, NFPA, and EGSA regarding required generator system service and testing.

## 3.0 Main Areas of Failures:

A generator system is a complex combination of electrical and mechanical components that are subject to stress and wear. Electrical components are subject to arcing and heat. Equipment can also be subject to stress when left unattended and stationary for long periods. Generator manufacturers know from years of experience the stresses that components in a system are subject to and have developed schedules to check or change certain items within the system before they fail.

When service and testing schedules are followed, the incidence of unplanned system shutdown is very low. Should an unscheduled shutdown or lack of performance occur, it can usually be traced to sectors of the system that should have been identified during routine planned maintenance schedules by a trained, authorized technician.

The following comprise a large percentage of problems encountered in practice: (See chart 1 front-page)

- **Unit will not start due to battery** - 80% of generators' failures to start are due to faults in the set's battery. Weak or low charged batteries are a common occurrence. Even a well-charged, well-maintained lead-acid battery will deteriorate over time. Batteries must be replaced when they no longer hold a proper charge. Battery charger systems and alternators should be checked weekly on sets used for standby and emergency applications, and at least monthly on other applications
- **Unit will not start due to fuel** - Lack of fuel or low quality fuel are often reasons generator-set engines fail to start or to give rated power. Fuel quality should be checked as part of any planned maintenance visit. Technicians working on diesel-fueled units will check if water or other contaminants are in the fuel or in the unit's filtration or delivery systems. Having no fuel in diesel and gaseous units could be due to a lack of storage capacity or poor delivery from the on-site storage.
- **Failure due to low oil pressure** - We recommend that the oil level for prime power sets be checked daily and maintained as closely as possible to the dipstick 'full' mark. The most accurate readings are taken ten minutes after running the unit under load and shutting down.
- **High temperature failure** - Low coolant levels due to cooling system leaks are the most common reason engines fail because of overheating.
- **Filters leading to reduced performance** - The air, oil and fuel filter elements must be changed per manufacturer's recommendations or whenever necessary due to site or operating conditions. Any blockage will restrict flow and result in reduced performance. Air and oil filter blockages also contribute to excessive engine wear.
- **Will not carry full load** - Regular testing under full load will identify issues that could prevent the generator from taking its rated load. Standby/emergency installations should be regularly exercised for 30 minutes with a minimum 30 percent electrical load at at least once a month. For critical standby applications, this is often increased to once a week. Fuel quality can also be an issue for poor performance.

## 4.0 Conclusions:

Practicing regular, planned maintenance by a qualified technician will play a critical role in reducing or eliminating future problems, minimizing potential failures and maximizing availability and reliability. It is most important that the technician diagnoses and correctly identifies the cause of a part or component failure, rather than simply replacing a failed part or component, to reduce the likelihood of a repeat failure.

## 5.0 Useful Data:

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